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Developing a Coordinated Plan for Ash (Fraxinus) Seed Collection in North America

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USDA-ARS North Central Regional Plant Introduction Station

Ames, Iowa

United States Department of Agriculture
Agricultural Research Service

NCRPIS
Providing Plant Genetic Resources for Agricultural Success
AMES, IOWA

Conserving the Biodiversity of Economically-important Plants

- In nature and traditional agricultural production systems
- In gardens (private collections, nurseries, botanical gardens and arboreta)
- In genebanks

Presenter comments can be viewed by hovering mouse over bubble, when present.

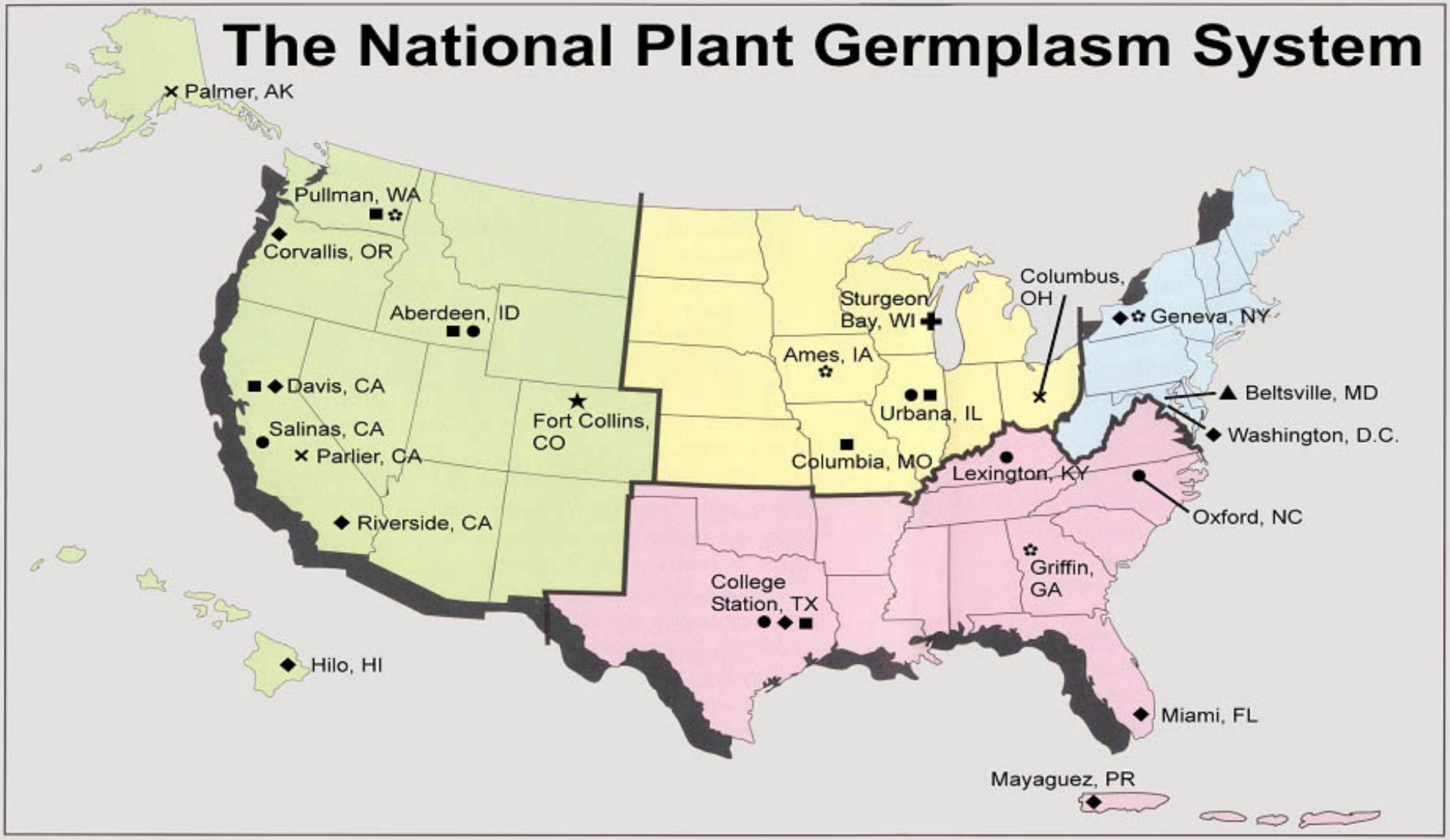
The US National Plant Germplasm System (NPGS)

- A network of genebanks coordinated by USDA-ARS
- Including…
  - Regional Plant Introduction Stations
  - Clonal Repositories and Crop-specific Collections
  - National Center for Genetic Resources Preservation
  - Germplasm Resources Information Network (GRIN)

NPGS Goals

- Long-term conservation of plant germplasm
- Collection and conservation of associated information (passport and evaluation)
- Making that germplasm and information widely available to support research, education, and agricultural production

The National Plant Germplasm System



- ✿ Regional Plant Introduction Station
- ● Crop-specific seed collection
- ■ Crop-specific genetic stocks collection
- ◆ National Clonal Germplasm Repository
- ★ National Seed Storage Laboratory, Fort Collins, Colorado
- ✚ National Potato Introduction Station, Sturgeon Bay, Wisconsin
- ▲ National Germplasm Resources Laboratory, National Plant Germplasm Quarantine Center, Beltsville, Maryland
- × Developing Site

Active Sites and Base Collection

Conserving Germplasm

- As seeds

Conserving Germplasm

- As plants

Conserving Germplasm

- Cryogenic storage

Key NPGS Units for *Fraxinus*

- North Central Regional Plant Introduction Station, Ames, IA (*Fraxinus* active site)
- Woody Landscape Plant Germplasm Repository at the US National Arboretum, Beltsville, MD
- Plant Exchange Office, Beltsville, MD
- National Center for Genetic Resources Preservation, Fort Collins, CO

The Key NPGS Contacts for *Fraxinus*

- NCRPIS, Ames, IA
  - Mark Widrlechner and Jeff Carstens
- WLPGR, Beltsville, MD
  - Kevin Conrad and Martin Scanlon
- PEO, Beltsville, MD
  - Ned Garvey and Karen Williams
- NCGRP, Fort Collins, CO
  - Dave Ellis and Gayle Volk

First NPGS Steps to Respond to the Threat of EAB

- Incorporate *Fraxinus* into the NCRPIS's 2008-2013 Project Plan (acquiring Asian and North American populations)
- NCGRP entered into agreements to store *Fraxinus* for USFS, NRCS, and tribal agencies
- 2007 New England collections (trial run)
- 2008 IL and MO collections
- Development of collection protocol document
- Collaborate with others working on conservation

Recent Field Collections

Collaborations

- Key to success
- A massive task at hand involving…
  - Unclear taxonomy
  - Wide geographic ranges
  - Time constraints (urgency)
  - Poorly characterized genetic structure and breeding systems
- Many potential partners with various missions, priorities and resources

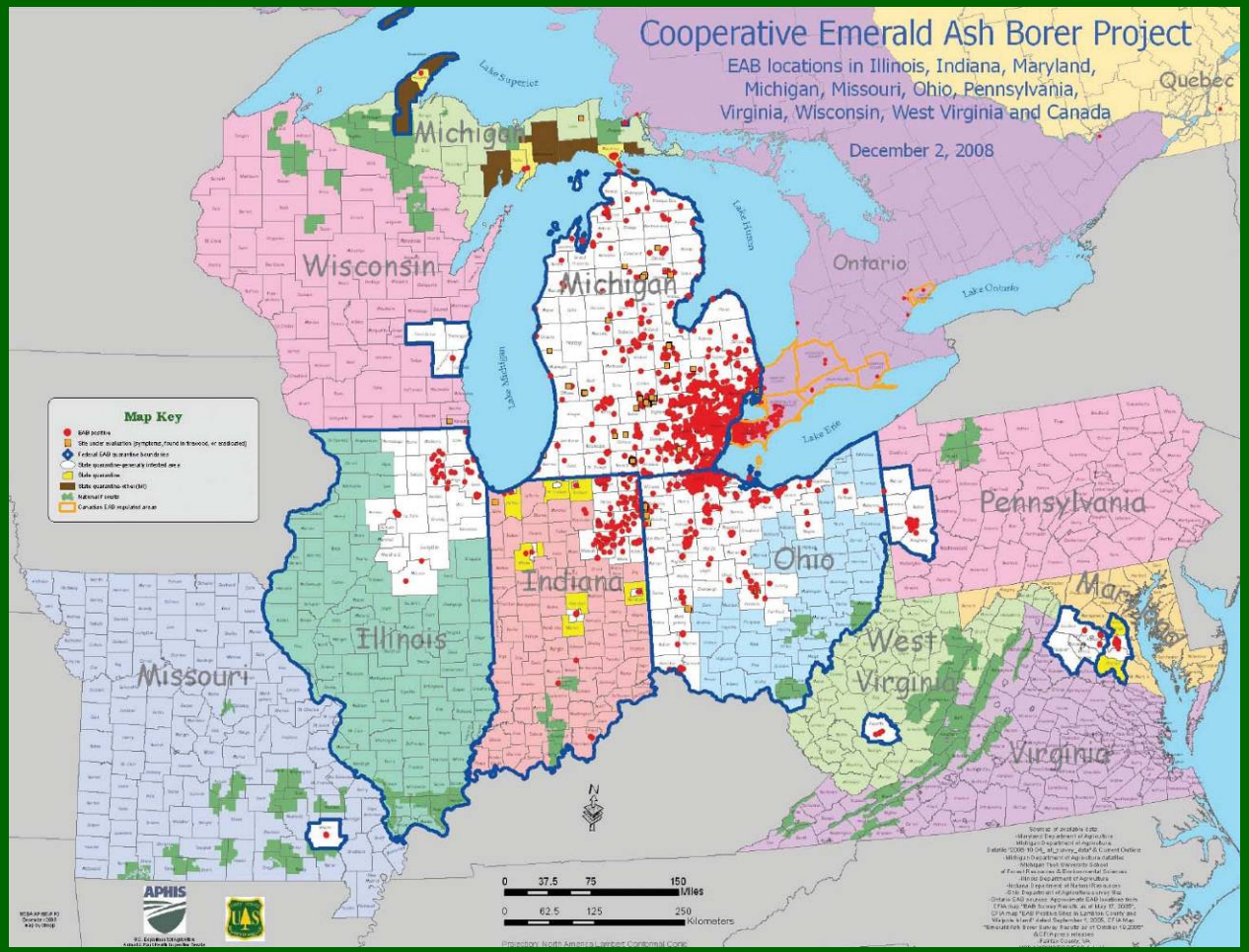
What do we know?
and
Where are the gaps?

- Taxonomy and keys (FNA, Miller, 1955)
- Geographic ranges and environmental diversity (Little, Omernik)
- Genetic diversity and structure
- Conservation methods
- Available resources

NCRPIS Progress

- Focusing on five species in Eastern North America
- Consulting with Morton Arboretum and Beijing BG on Asian collections
- So far, have acquired 150+ accessions from North America, 16 from Asia, and 30 from Europe
- Collaboration on development of cryogenic storage protocol

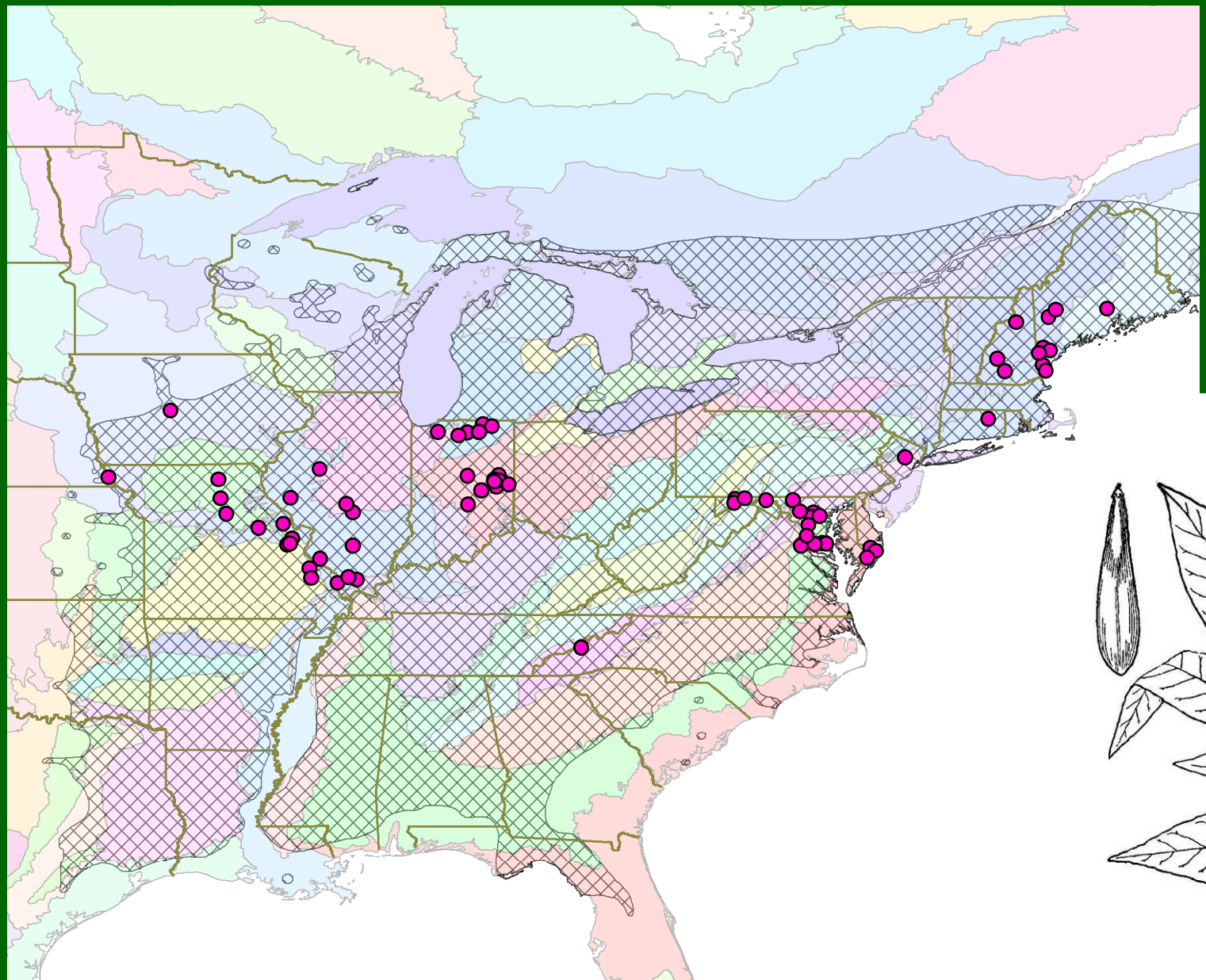
Staying Ahead of EAB



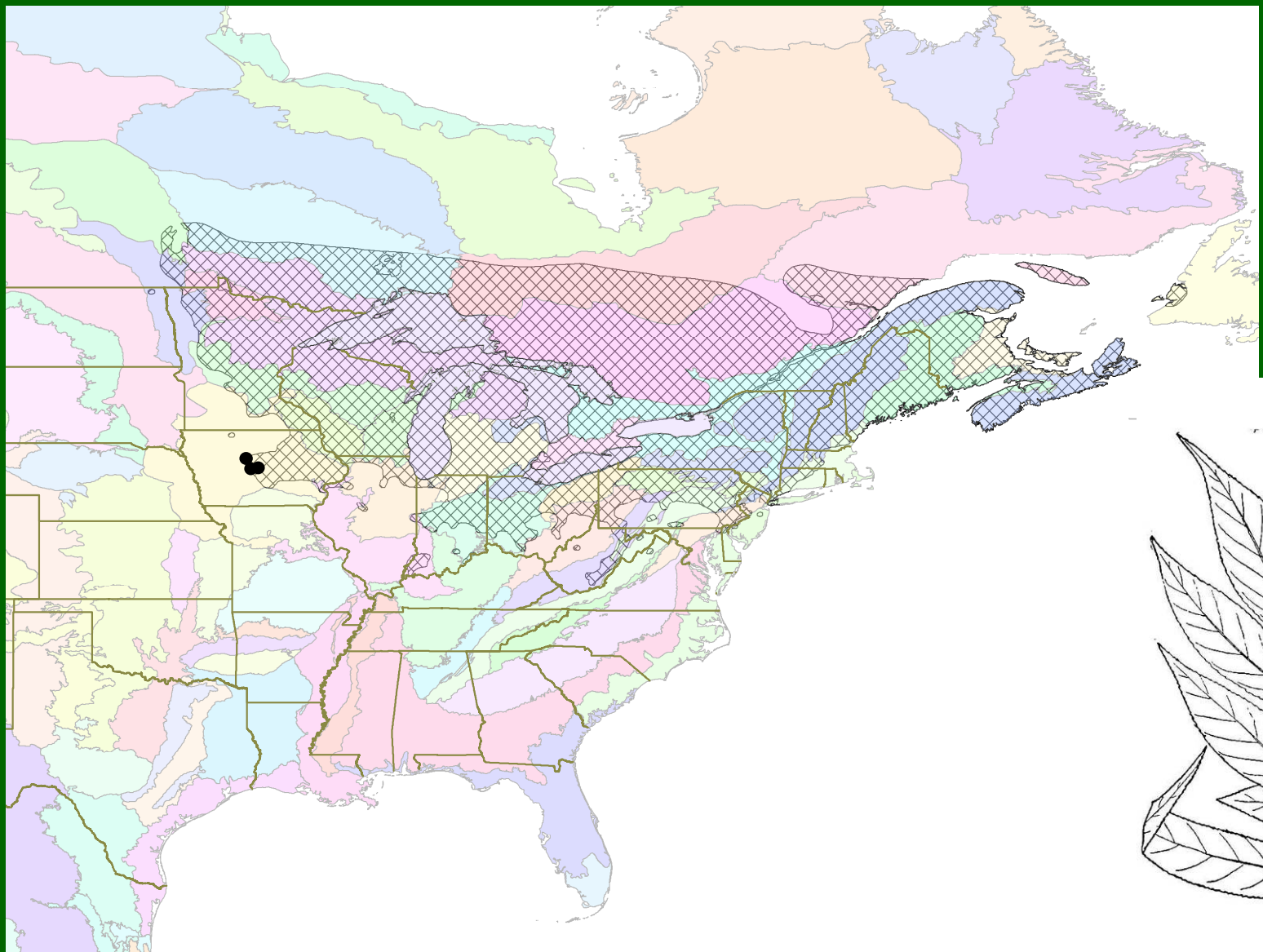
http://www.emeraldashborer.info

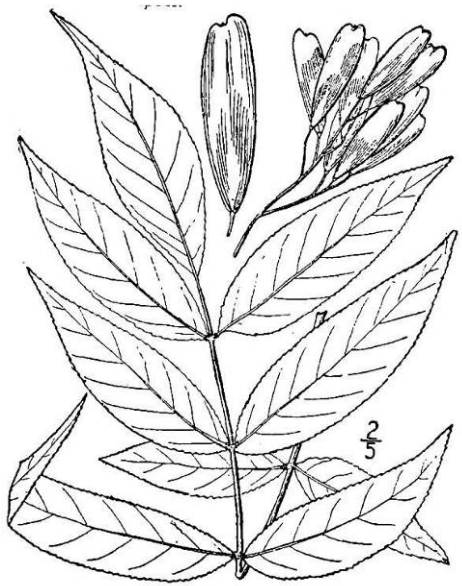
Environmental Diversity (Omernik Level III Map)

Fraxinus americana

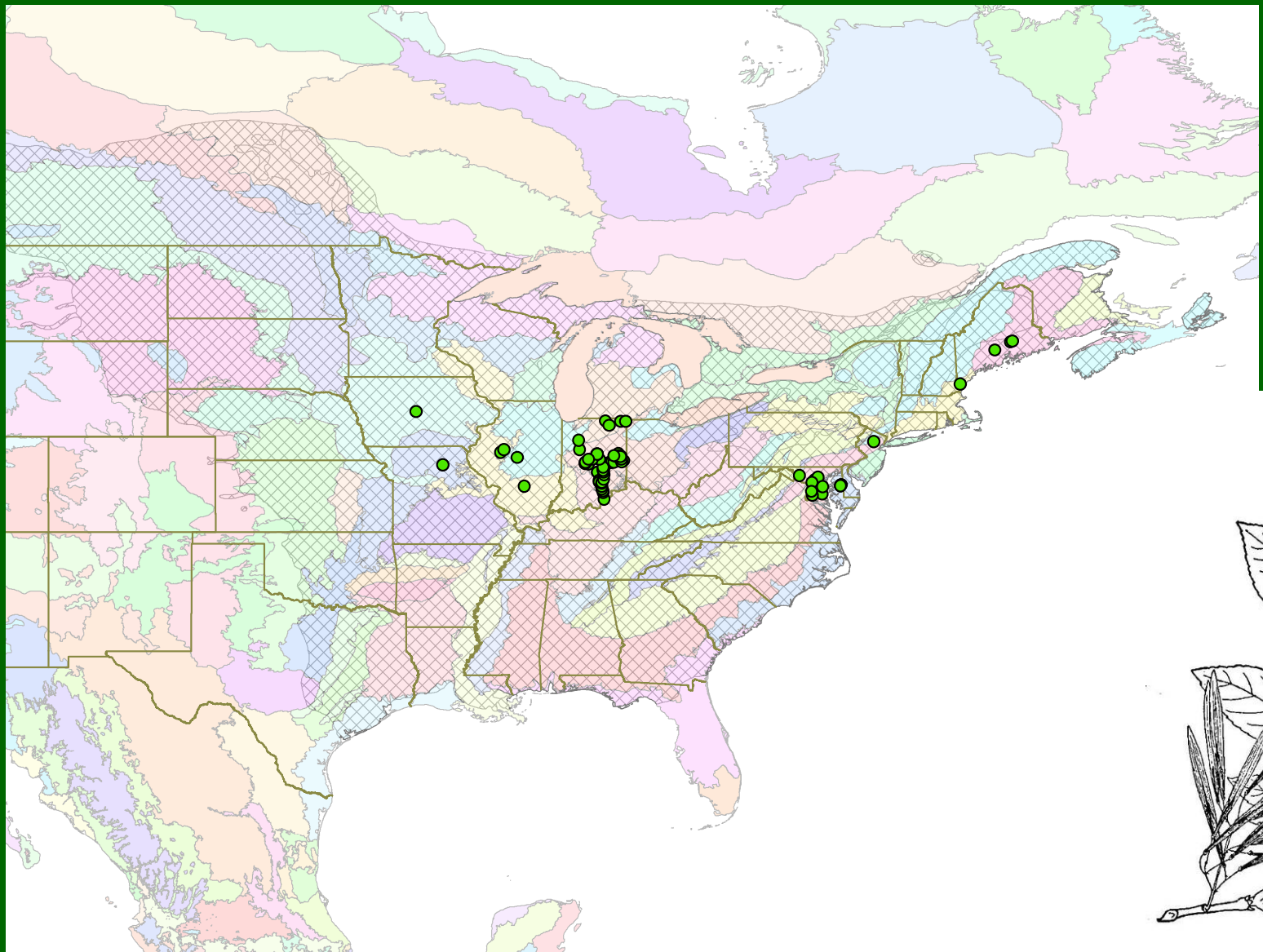


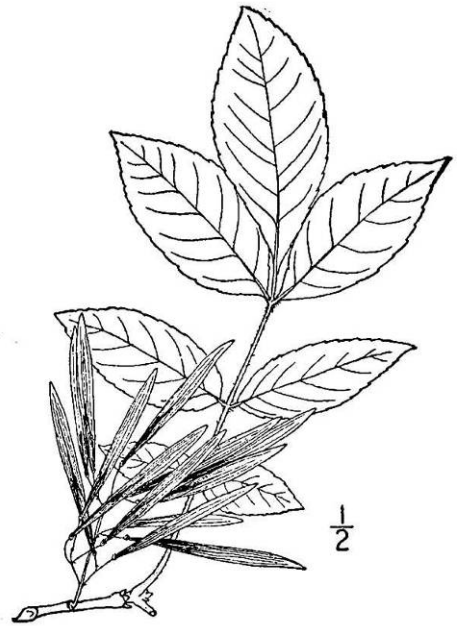
Fraxinus nigra



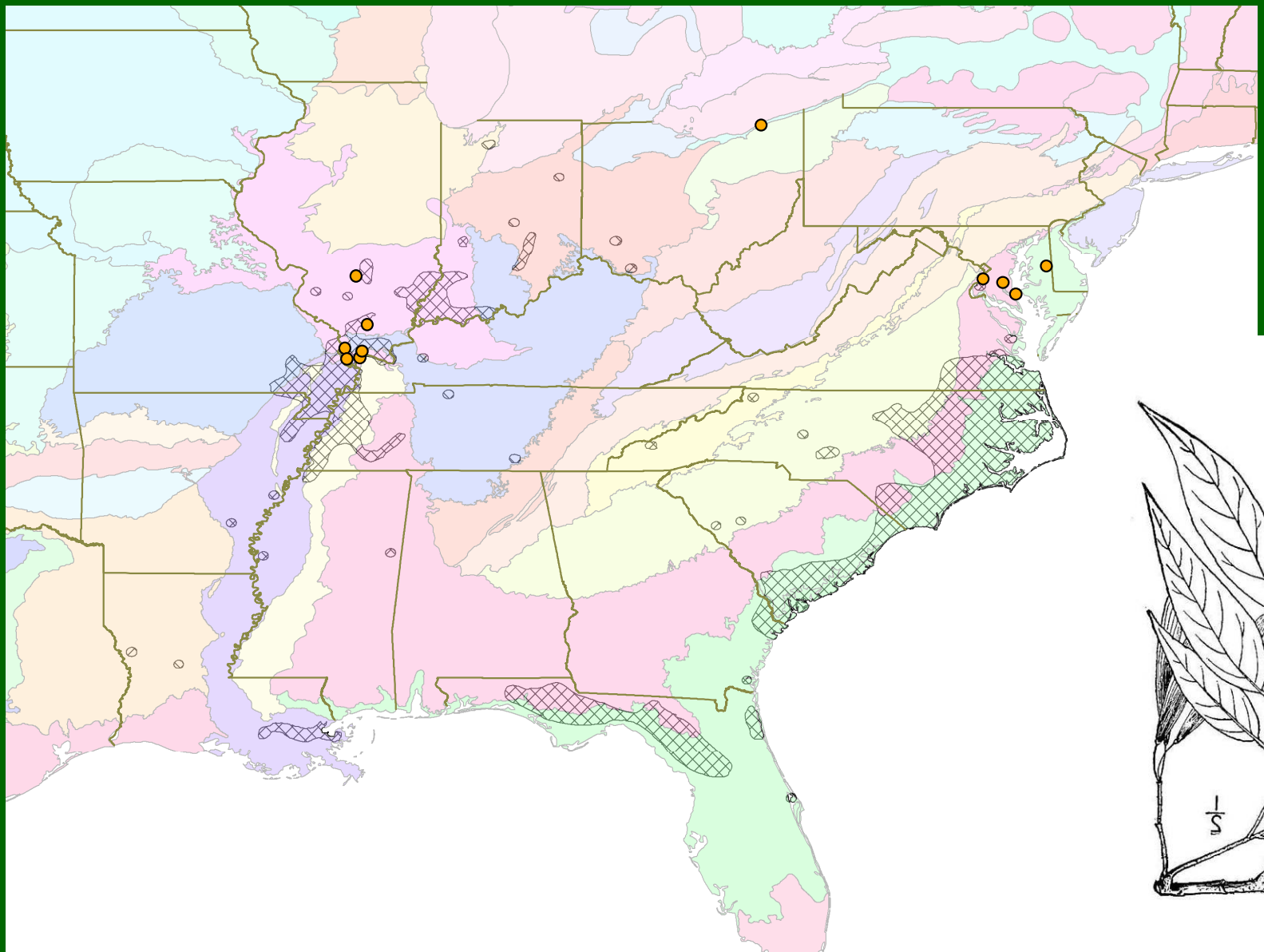


Fraxinus pennsylvanica

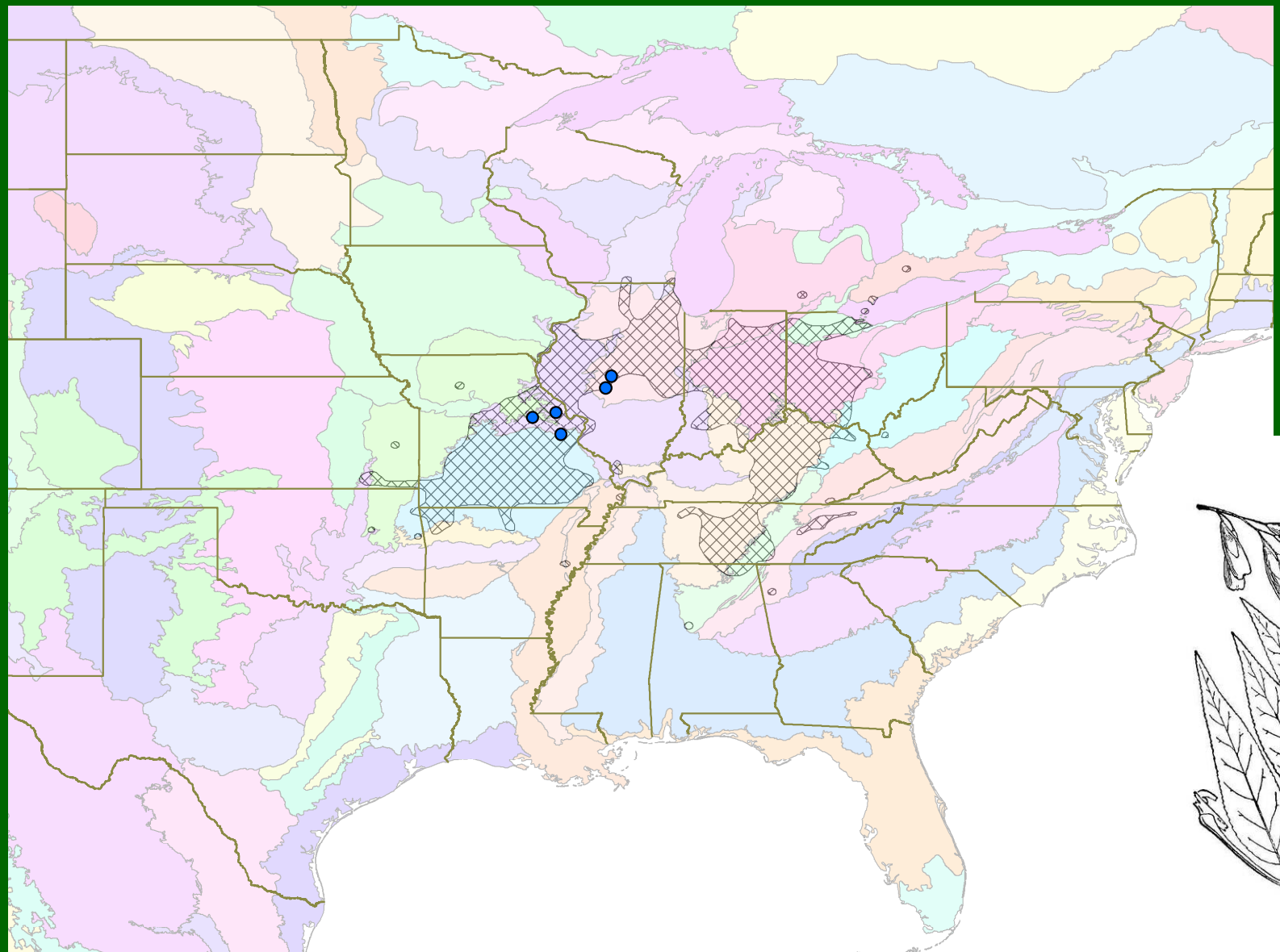




Fraxinus profunda



Fraxinus quadrangulata



How to Build These Collections Most Efficiently

- Staying ahead of EAB
- Recognizing year-to-year variation in seed production and altering collection plans to take advantage of it
- Meeting partners' needs while advancing the breadth and quality of the NPGS collection

How to Build These Collections Most Efficiently (cont.)

- Ensuring seed quality
- Ensuring proper taxonomic IDs
  - Species-specific DNA marker development
- Obtaining good passport data
- Optimizing sampling strategies
  - Number of mother trees to sample per site
  - Distance between sites
  - Maximize diversity sampled

How to Build These Collections Most Efficiently (cont.)

- Setting a strategy and priorities
  - Collection plans
  - Filling information gaps
- Developing and supporting an on-the-ground network
- Keeping good lines of communication open

Sources for Maps and Images

- EAB status http://www.emeraldashborer.info
- Omernik Level III Map http://www.epa.gov/wed/pages/ecoregions.htm
- Range Maps http://esp.cr.usgs.gov/info/veg-clim/

  U.S. Geological Survey, 1999, Digital representation of "Atlas of United States Trees" by Elbert L. Little, Jr.
- Plant Images http://plants.usda.gov

  USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*.